

Docket. No. 7002/3

What is claimed is:

1. A self-tightening keyless chuck for gripping a tool shank, comprising:

a rear sleeve (1);  
a body (2);  
a bearing ring (3);  
a bearing assembly (4);  
a nut (5);  
a jaw (6);  
a front sleeve (7); and  
a stopper (8),

wherein the surface of at least one of the bearing ring (3) and the nut (5) that faces the bearing assembly (4) is provided with a recessed circumferential arcuate race (9), and a plurality of ball-shape grooves (10) are uniformly formed in an arcuate bottom surface of the arcuate race (9),  
and wherein the front sleeve (7) engages with the nut (5) through radial smooth press-fit.

2. The self-tightening keyless chuck according to claim 1, wherein the nut (5) is provided with two angularly-cut split notches (11) that are symmetrically positioned on both ends of a diameter of the nut, the angularly-cut split notches (11) having a cut-out angle between 30 and 75°.

3. A self-tightening keyless chuck for gripping a tool shank, comprising:

a rear sleeve (1);  
a body (2);  
an upper bearing ring (31);  
a bearing assembly (4);  
a lower bearing ring (32);  
a nut (5);  
a jaw (6);  
a front sleeve (7); and  
a stopper (8),

wherein the surface of at least one of the upper bearing ring (31) and the lower bearing ring (32) that faces the bearing assembly (4) is provided with a recessed circumferential arcuate race (9), and a plurality of ball-shape grooves (10) are uniformly formed in an arcuate bottom surface of the arcuate race (9),  
and wherein the front sleeve (7) engages with the nut (5) through radial smooth press-fit.

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4. The self-tightening keyless chuck according to claim 3, wherein the nut (5) is provided with two angularly-cut split notches (11) that are symmetrically positioned on both ends of a diameter of the nut, the angularly-cut split notches (11) having a cut-out angle between  $30^\circ$  and  $75^\circ$ ,  
and wherein two parallel cut-out surfaces (13) are symmetrically formed on the outer peripheral surface of the nut (5), which extend downwards in an axial direction from the front end surface of the nut (5) by one third of the thickness of the nut and are located at an angle of  $90^\circ$  relative to the positions of angularly-cut split notches (11).
5. The self-tightening keyless chuck according to claim 1 or 3, wherein the front sleeve (7) is press cast using a press-casting metal or a powdered metallurgic material.
6. The self-tightening keyless chuck according to claim 1 or 3, wherein the recessed circumferential arcuate race (9) has an arc radius R from 1.5 to 2.5 millimeters and a depth H from 0.05 to 0.30 millimeters.
7. The self-tightening keyless chuck according to claim 1 or 3, wherein the number of ball-shaped grooves (10) ranges from 20 to 80.
8. The self-tightening keyless chuck according to claim 1 or 3, wherein the ball-shaped grooves (10) have a spherical radius r from 1.0 to 2.0 millimeters and a depth h from 0.01 to 0.10 millimeters.
9. The self-tightening keyless chuck according to claim 3, wherein the upper bearing ring (31) and the lower bearing ring (32) have the same external dimensions and the same surface structure.
10. The self-tightening keyless chuck according to claim 3, wherein the upper bearing ring (31) and the lower bearing ring (32) have different external dimensions and different surface structures, their differences including the inside diameter and the thickness of the bearing rings.